

- 1 1. A method of analyzing a digitized signal to determine model parameters for the digitized  
2 signal, the method comprising:  
3 receiving a digitized signal;  
4 determining a voiced strength for the digitized signal by evaluating a first function; and  
5 determining a pulsed strength for the digitized signal by evaluating a second function.
- 6 2. The method of claim 1 wherein determining the voiced strength and determining the pulsed  
7 strength are performed at regular intervals of time.
- 8 3. The method of claim 1 wherein determining the voiced strength and determining the pulsed  
9 strength are performed on one or more frequency bands.
- 10 4. The method of claim 1 wherein determining the voiced strength and determining the pulsed  
11 strength are performed on two or more frequency bands and the first function is the same as  
12 the second function.
- 13 5. The method of claim 1 wherein the voiced strength and the pulsed strength are used to  
14 encode the digitized signal.
- 15 6. The method of claim 1 wherein the voiced strength is used in determining the pulsed  
16 strength.
- 17 7. The method of claim 1 wherein the pulsed strength is determined using a pulse signal  
18 estimated from the digitized signal.
- 19 8. The method of claim 7 wherein the pulsed signal is determined by combining a transform  
20 magnitude with a transform phase computed from a transform magnitude.
- 21 9. The method of claim 8 wherein the transform phase is near minimum phase.
- 22 10. The method of claim 7 wherein the pulsed strength is determined using a pulsed signal  
23 estimated from a pulse signal and at least one pulse position.
- 24 11. The method of claim 1 wherein the pulsed strength is determined by comparing a pulsed  
25 signal with the digitized signal.
- 26 12. The method of claim 11 wherein the pulsed strength is determined by performing a  
27 comparison using an error criterion with reduced sensitivity to time shifts.

- 1 13. The method of claim 12 wherein the error criterion computes phase differences between  
2 frequency samples.
- 3 14. The method of claim 13 wherein the effect of constant phase differences is removed.
- 4 15. The method of claim 1 further comprising:  
5 quantizing the pulsed strength using a weighted vector quantization; and  
6 quantizing the voiced strength using weighted vector quantization.
- 7 16. The method of claim 1 wherein the voiced strength and the pulsed strength are used to  
8 estimate one or more model parameters.
- 9 17. The method of claim 1 further comprising determining the unvoiced strength.
- 10 18. A method of synthesizing a signal, the method comprising:  
11 determining a voiced signal;  
12 determining a voiced strength;  
13 determining a pulsed signal;  
14 determining a pulsed strength;  
15 dividing the voiced signal and the pulsed signal into two or more frequency bands; and  
16 combining the voiced signal and the pulsed signal based on the voiced strength and the  
17 pulsed strength.
- 18 19. The method of claim 18 wherein the pulsed signal is determined by combining a transform  
19 magnitude with a transform phase computed from the transform magnitude.
- 20 20. A method of synthesizing a signal, the method comprising:  
21 determining a voiced signal;  
22 determining a voiced strength;  
23 determining a pulsed signal;  
24 determining a pulsed strength;  
25 determining an unvoiced signal;  
26 determining an unvoiced strength;

dividing the voiced signal, pulsed signal, and unvoiced signal into two or more frequency bands; and  
combining the voiced signal, the pulsed signal, and the unvoiced signal based on the voiced strength, the pulsed strength, and the unvoiced strength.

21. A method of quantizing speech model parameters, the method comprising:

determining the voiced error between a voiced strength parameter and quantized voiced strength parameters;  
determining the pulsed error between a pulsed strength parameter and quantized pulsed strength parameters;  
combining the voiced error and the pulsed error to produce a total error; and  
selecting the quantized voice strength and the quantized pulsed strength which produce the smallest total error.

22. A method of quantizing speech model parameters, the method comprising:

determining a quantized voiced strength;  
determining a quantized pulsed strength; and  
quantizing a fundamental frequency based on the quantized voice strength and the quantized pulsed strength.

23. The method of claim 22 wherein the fundamental frequency is quantized to a constant when the quantized voiced strength is zero for all frequency bands.

24. A method of quantizing speech model parameters, the method comprising:

determining a quantized voiced strength;  
determining a quantized pulsed strength; and  
quantizing a pulse position based on the quantized voiced strength and the quantized pulsed strength.

25. The method of claim 24 wherein the pulse position is quantized to a constant when the quantized voiced strength is nonzero in any frequency band.

26. A computer software system for analyzing a digitized signal to determine model parameters for the digitized signal comprising:
- a voiced analysis unit operable to determine a voiced strength for the digitized signal by evaluating a first function; and
  - a pulsed analysis unit operable to determine a pulsed strength for the digitized signal by evaluating a second function.
27. The system of claim 26 wherein the voiced strength and the pulsed strength are determined at regular intervals of time.
28. The system of claim 26 wherein the voiced strength and the pulsed strength are determined on one or more frequency bands.
29. The system of claim 26 wherein the voiced strength and the pulsed strength are determined on two or more frequency bands and the first function is the same as the second function.
30. The system of claim 26 wherein the voiced strength and the pulsed strength are used to encode the digitized signal.
31. The system of claim 26 wherein the voiced strength is used to determine the pulsed strength.
32. The system of claim 26 wherein the pulsed strength is determined using a pulse signal estimated from the digitized signal.
33. The system of claim 32 wherein the pulsed signal is determined by combining a transform magnitude with a transform phase computed from a transform magnitude.
34. The system of claim 33 wherein the transform phase is near minimum phase.
35. The system of claim 32 wherein the pulsed strength is determined using a pulsed signal estimated from a pulse signal and at least one pulse position.
36. The system of claim 26 wherein the pulsed strength is determined by comparing a pulsed signal with the digitized signal.
37. The system of claim 36 wherein the pulsed strength is determined by performing a comparison using an error criterion with reduced sensitivity to time shifts.

38. The system of claim 37 wherein the error criterion computes phase differences between frequency samples.

39. The system of claim 38 wherein the effect of constant phase differences is removed.

40. The system of claim 26 further comprising an unvoiced analysis unit.

41. A method of analyzing a digitized signal to determine model parameters for the digitized signal, the method comprising:

receiving a digitized signal; and

evaluating an error criterion with reduced sensitivity to time shifts to determine pulse parameters for the digitized signal.

42. The method of claim 41 further comprising determining a pulsed strength.

43. The method of claim 42 wherein the pulsed strength is determined in two or more frequency bands.

44. The method of claim 41 wherein the error criterion computes phase differences between frequency samples.

45. The method of claim 44 wherein the effect of constant phase differences is removed.